PATENT APPLICATION TRANSMITTAL LETTER
(Small Entity)

Docket No.
725/72073-2

TO THE ASSISTANT COMMISSIONER FOR PATENTS

Transmitted herewith for filing under 35 U.S.C. 111 and 37 C.F.R. 1.53 is the patent application of:

Romolo BITELLI

For: **HEAVY VEHICLE FOR BREAKING UP GROUND WITH RETRACTING AND STEERING REAR WHEELS**

Enclosed are:

- ☐ Certificate of Mailing with Express Mail Mailing Label No.
- ☒ **Six (6)** sheets of drawings.
- ☒ A certified copy of a **Italian** application.
- ☒ Declaration ☒ Signed. ☐ Unsigned.
- ☒ Power of Attorney
- ☐ Information Disclosure Statement
- ☐ Preliminary Amendment
- ☒ **One (1)** Verified Statement(s) to Establish Small Entity Status Under 37 C.F.R. 1.9 and 1.27.
- ☐ Other:

CLAIMS AS FILED

For	#Filed	#Allowed	#Extra		Rate	Fee
Total Claims	10	- 20 =	0	x	$9.00	$0.00
Indep. Claims	1	- 3 =	0	x	$39.00	$0.00
Multiple Dependent Claims (check if applicable) ☐						$0.00
					BASIC FEE	$345.00
					TOTAL FILING FEE	$345.00

- ☒ A check in the amount of **$345.00** to cover the filing fee is enclosed.
- ☒ The Commissioner is hereby authorized to charge and credit Deposit Account No. **23-0575** as described below. A duplicate copy of this sheet is enclosed.
  - ☐ Charge the amount of as filing fee.
  - ☐ Credit any overpayment.
  - ☒ Charge any additional filing fees required under 37 C.F.R. 1.16 and 1.17.
  - ☐ Charge the issue fee set in 37 C.F.R. 1.18 at the mailing of the Notice of Allowance, pursuant to 37 C.F.R. 1.311(b).

Dated: **March 20, 2000**

Signature

John P. DeLuca
Registration No. 25,505

cc:

Attorney's Docket No: 725/72073-2

Applicant or Patentee: Romolo BITELLI

Serial or Patent No.: _____

Filed or Issued: _____

Title: HEAVY VEHICLE FOR BREAKING UP GROUND WITH RETRACTING AND STEERING REAR WHEELS

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 C.F.R. §1.9(f) AND 1.27 (c)) - SMALL BUSINESS CONCERN

I hereby declare that I am

[X] the owner of the small business concern identified below:
[ ] an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN: BITELLI SPA

ADDRESS OF CONCERN: VIA IV NOVEMBRE, 2 - 40061 MINERBIO (BO) - ITALY

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 37 C.F.R. §121.3-18, and reproduced in 37 C.F.R. §1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled HEAVY VEHICLE FOR BREAKING UP GROUND WITH RETRACTING AND STEERING REAR WHEELS

by inventor (s) Romolo BITELLI

described in:

[X] the specification filed herewith

[ ] application serial no._____, filed _____

[ ] patent no. _____, issued _____

If the rights held by the above-identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 C.F.R. §1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 C.F.R. §1.9(d), or a nonprofit organization under 37 C.F.R. §1.9(e). *NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 C.F.R. §1.27)

FULL NAME _____

ADDRESS _____
[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NON PROFIT ORGANIZATION

FULL NAME _____

ADDRESS _____
[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NON PROFIT ORGANIZATION

FULL NAME _____

ADDRESS _____
[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NON PROFIT ORGANIZATION

I acknowledge the duty to file in this application or patent notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 C.F.R. §1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING Romolo BITELLI

TITLE OF PERSON OTHER THAN OWNER _____

ADDRESS OF PERSON SIGNING VIA JUSSI, 18 - S. LAZZARO (BO) - ITALY

_____

SIGNATURE _____ DATE July 5, 1999

HEAVY VEHICLE FOR BREAKING UP GROUND WITH RETRACTING AND STEERING REAR WHEELS

BACKGROUND OF THE INVENTION

The invention concerns a heavy vehicle for breaking up ground provided with retracting and steering rear wheels.

It is known that for breaking up ground, specific heavy vehicles are used equipped with wheels or tracks depending on how they are implemented and provided with equipment suited to breaking up the actual ground.

Scarifiers are, for instance, known for this purpose that are heavy vehicles used to break up the bituminous surface covering road courses.

A scarifier fundamentally consists of a frame made of heavy-duty metal bodywork, provided with a ripper drum that is set against the ground to be broken up and is supported by a horizontal shaft around which it is rotated.

The frame, which is shaped to provide a driver's cab where the operator sits, is in turn supported by a pair of front drive wheels or tracks and a pair of rear wheels or tracks, either with drive or free, the latter being located next to the ripper drum.
Traction systems, housed in an engine compartment formed out of the frame, set the ripper drum in rotation to break up the ground and the wheels or tracks to move the machine.

The rear wheels or tracks are connected to a sole-plate supported by a hydraulic cylinder that allows a vertical movement to adjust the depth the ripper drum penetrates into the ground while an articulation fixed to the frame and connected to the actual sole-plate allows one or both wheels or tracks to be set in a retracted position inside the frame.

The rear wheels or tracks when extracted from the frame, allow better weight distribution primarily during the machine's use, while the possibility of at least one wheel or one track retracting under the frame, allows the machine to be used for digging right up to the wall of the work area.

What's more the position of one or more of the rear wheels or tracks when retracted into the side of the machine, allows to reduce the machine's overall dimensions and aid road transport when it is moved from one work site to another.
Known machines equipped with one or both rear wheels or tracks retractable are extended manually and therefore by operations that are awkward for the operator since, to carry them out he has to get down from the machine and go to one or both of its sides to shift the wheels or tracks.

As an alternative to manual retraction, the depositee of this invention has filed an Italian patent application having protocol number V198U000098 which describes a heavy vehicle for breaking up ground in which the changeover of one or both rear wheels or tracks from extracted to retracted into the frame and vice versa, as well as locking them in their final position, is achieved automatically by controls inside the driver's cab.

One limitation shown by the machine described in the aforementioned patent is that when the rear wheels or tracks are set in their retracted position inside the frame, when turning they scrape the ground with considerable resistance. This problem is particularly accentuated when the machine is fitted with tracks rather than wheels, because in this case the resistance while turning is even higher because of the greater surface area in contact with the ground.

SUMMARY OF THE INVENTION

This invention sets the scope of eliminating this inconvenience by producing a machine for breaking up ground provided with at least one rear steering wheel or track. An additional scope is that these steering wheels or tracks can also retract into the side of the machine.

Said scopes are achieved by producing a machine for breaking up ground that in accordance with the main claim comprising:

a frame supported by at least one pair of front wheels or tracks and by at least one pair of rear wheels or tracks;

at least one driver's cab being part of said frame;

means of breaking up the ground connected to said frame;

traction systems supported by said frame to rotate one or more of said wheels or said tracks;

wherein at least one of said rear wheels or said rear tracks has its horizontal axis belonging to a chassis being a integral part of said frame and having at least one first actuator that works with maneuvering systems accessible from
said driver's cab to rotate said rear wheel or track around a vertical axis while turning the machine's front wheels.

According to a preferred form of execution the machine is a scarifier mounted on tracks where the two front tracks are both steering and two rear ones, one being fixed and one retractable and steering.

The means of turning the machine include first actuators that work with the rear wheel or track and second actuators that work with both front wheels or tracks, which consist of hydraulic cylinders supplied by slide valves.
In particular the slide valve that operates the steering hydraulic cylinder of the rear track is controlled by solenoid valves, while the slide valve that supplies the hydraulic cylinder for steering the front tracks is controlled directly by the power steering connected to the steering column in the driver's cab. The operation of both hydraulic cylinders is interlinked by means of controls to co-ordinate turning, which include potentiometric position detectors or similar, cooperating mechanically with each hydraulic cylinder and electrically wired to an electronic control unit. This is also electrically wired to the solenoid valves that pilot the slide valves supplying the hydraulic cylinder steering the rear track and a position signal for the rear wheel or track when it is set in its retracted position inside the frame.

An advantage of the scarifier invention is that it is easier to drive above all during turning operations.

Another advantage is that the wear on the tracks is also reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

The aforesaid scopes and advantages will be better illustrated during the description of a preferred form of execution of the invention that is given as a guideline but not a limitation and refers to the attached diagrams where:

Fig. 1 illustrates a line drawing of the side view of the machine invention;
Fig. 2 illustrates in an isometric drawing of a detail of the machine in Fig. 1;
Fig. 3 illustrates an aerial view of the detail in Fig. 2;
Figures 4 to 6 illustrate line drawings of aerial views of the set-up of the tracks on the machine in Fig. 1 in three different working positions;
Fig. 7 shows the hydraulic control diagram of the tracks of the machine in Fig.1 and electrical wiring of the control unit.

DESCRIPTION OF THE INVENTION

As seen in Fig. 1 the machine invention, generally indicated by 1, is a scarifier suited for breaking up the bituminous surface that covers road courses. The concepts

that will be described below can nevertheless be applied to a machine for breaking up other kinds of terrain.

The scarifier includes a frame 2, supported by a pair of front tracks 3, 3' and by a pair of rear tracks 4, 4', which is shaped to provide a driver's cab generally indicated by 5.

To the rear of the machine and between the rear tracks 4, 4' there is a ripper drum 6 that is rotated around its horizontal axis 6' by traction systems inside the frame 2 and not illustrated here, which by means of gears and mechanisms, again not illustrated here, also rotate one or more of said tracks. It is clear that in different executions the machine invention may be fitted with wheels instead of tracks.

According to the invention at least one of said rear wheels or tracks 4 has its horizontal axis 7 belonging to a chassis 8 being a integral part of said frame 2 and having at least one first actuator 9 that works with maneuvering systems 10 accessible from said driver's cab 5 to rotate said rear wheel or track 4 around a vertical axis 13 while turning the front wheels or tracks 3, 3' of the machine.

In particular the maneuvering systems consist of the machine's steering column 10.

As seen in Fig. 2 and also in Fig. 3 the chassis generally indicated by 8 that support the rear track 4, includes a yoke 12 connected to the track 4, having a vertical pivot journal 13 that is coupled to revolve on a support plate 14 fixed to a second actuator 15 being a integral part of the frame 2.

In detail, as seen in Fig. 4, the second actuator 15 is a second hydraulic jack that has the end of its rod 16 fixed to the plate 14 and the cylinder end 17 where the rod 16 slides, being integral with the frame 2 of the machine.

In particular the cylinder 17, as seen in Fig. 4, is connected to the frame 2 by means of a first articulation generally indicated by 18 and of the type described in the aforementioned Italian patent V198U000098. The first actuation group comprises a four- bar linkage wherein the bars 18a and 18b are moved by hudraulic actuators. This allows the whole chassis 8 to move with the track 4 connected to it, in any one of the directions of the arrow 19 with reference to a fixed point 20 on the frame, to retract the track 4 into frame of the machine as seen in Fig. 1.

With regards to the first actuator generally indicated by 9 and belonging to the chassis 8, it can be seen that it consists of a first hydraulic jack that, as seen in fig.'s 2 and 3, has the rod end 21 hinged to the yoke 12 while the cylinder end 22, where the rod 21 slides, is hinged to the plate 14.

With regards to the front tracks 3, 3' it can be seen in fig. 4 that each of them is supported by a chassis 23, 23' that couples it to revolve on a pivot journal 24, 24' connected vertically to the frame 2.

The front tracks 3, 3' are moreover interlinked by means of a second articulation generally indicated by 25 that is made up of a central rod 26 hinged to a pair of side rods 26', 26", each of them in turn being hinged to their relative chassis 23, 23' respectively of the front tracks 3, 3'.

It can also be seen that the front track 3 works with a third actuator generally indicated by 27 that consists of a third hydraulic jack having the rod end 28 hinged to the chassis 23 and the cylinder end 29, where the rod 28 slides, hinged to the frame 2 of the machine.

When the rod 28 thrusts in or out of its relative cylinder 29, it forces the chassis 23 to rotate around the vertical axis or pivot journal 24 and by means of the second articulation 25 also transmits this rotation to the front track 3' next to it, making the machine turn.

It can be seen in Fig. 7 that the first and third hydraulic jacks or first acutator 9 and third actuator 27, respectively, are supplied by the pressurized oil distribution circuit generally indicated by 30. This includes a first slide valve 31 piloted by solenoid valves 31' and 31" that supply the first hydraulic jack 9 and by a third slide valve 32 that is controlled by the steering column or maneuvering system 10 of the machine, which supplies the third hydraulic jack or third actuator 27.

The distribution circuit also includes a first position detector 33 of the first hydraulic jack 9 and a third position detector 34 of the third hydraulic jack 27 that consist of potentiometric position detectors or similar, connected to an electronic control unit 35 for the coordinated control of the turning angles of the front tracks 3, 3' and the rear track 4.

It can be seen that there is also a position signal 36 preferably consisting of a travel switch that detects the retracted position of the rear track 4.

The travel switch 36 together with the potentiometric detectors 33, 34' and the solenoid valves 31', 31", are electrically wired to the electronic control unit 35 that co-ordinates their operation, controlling the turn.

A pump 37 completes the circuit.

It works so that when the machine's traction systems are operating, adjusting the steering column or maneuvering system 10 by turning it in any of the directions indicated by the arrow 40, pressure is applied to the third actuator or hydraulic jack 27

that turns the front tracks 3, 3', for instance making them turn counterclockwise 38 as illustrated in Fig. 6 around a pivot center 39.

The third position detector 34 transmits the signal to the electronic control unit 35, which operates the solenoid valve 31' or 31" of the first actuator or hydraulic jack 9, causing a rotation also for the track 4 according to a calculated geometry in the 35 same counterclockwise direction 38 around the same pivot center 39.

The third position detector 34 keeps control of how the turn is progressing by sending signals to the electronic control unit 35.

The position signal 36 detects when the rear track 4 is in its retracted position inside the frame that can be seen in Fig. 6.

It is nevertheless clear that the rear track 4 can also be turned when it is in its extracted position.

The track 4 is set in its retracted position inside the frame and then is reset in the extracted position that can be seen in Fig. 4 by acting from inside the driver's cab by means of control systems of the first articulation 18, that has not been illustrated, that is thereby made to turn in any of the directions of the arrow 19 and whose operation is illustrated in the aforementioned Italian patent V198U000098.

The above description amply shows that the machine invention achieves all the set scopes.

In a different form of execution, the machine invention may have both rear tracks steering.

In the execution phase, the machine invention may undergo changes or variations in construction all falling under the protection of the main claim that shall therefore all be considered protected by this patent.

CLAIMS

What is claimed is:

1. A steerable machine for breaking up ground comprising:

a frame;

at least one pair of rollable front supports and at least one pair of rollable rear supports, each of said front and rear supports including a chassis secured to the frame and said front supports being rotatable about a front vertical axis and at least one of the rear supports being pivotable about a rear vertical axis;

at least one driver's cab located in said frame;

a means for breaking up the ground connected to said frame;

traction means supported by said frame for rotating at least one of said rotatable supports;

at least one first actuator operatively coupled to the rear supports;

a maneuvering system accessible from said driver's cab for operating the actuator for rotating said rear supports about the rear vertical axis while turning the front supports of the machine.

2. The machine according to claim 1, wherein:

said chassis includes a yoke that supports said rear support, and has a vertical pivot journal coupled to revolve on a support plate fixed to an end of a second actuator integral with said frame.

3. The machine according to claim 2, wherein:

said first actuator comprises a first hydraulic jack having a first rod end fixed to said yoke and a first cylinder end,

wherein said rod slides, fixed to said plate.

4. The machine according to claim 2, wherein:

said second actuator comprises a second hydraulic jack set with a vertical axis, which has a second rod end fixed to said plate and a second cylinder end,

wherein said rod slides, integral with said frame.

5. The machine according to claim 4, wherein:

the cylinder of said second hydraulic jack is an integral part of said frame being connected thereto by means of a first articulation for moving said chassis with respect to a fixed point on said frame in order to move the rotatable support inward of said frame.

6. The machine according to claim 1, wherein:

the chassis of said front supports are interlinked by means of a second articulation, at least one of said chassis cooperating with a third actuator for rotating the chassis around a vertical axis.

7. The machine according to claim 6, wherein:

said third actuator comprises a third hydraulic having a third rod end pivoted to said chassis of said front support and a third cylinder end,

wherein said rod slides, pivoted on said frame.

8. The machine according to claim 2, wherein:

said jacks comprise hydraulic two-way jacks connected to a distribution circuit of oil under pressure.

9. The machine according to claim 8, wherein:

said distribution circuit comprises:

a first slide valve piloted by solenoid valves that supply said first hydraulic jack;

a third slide valve controlled by said maneuvering system of said machine that supply said third hydraulic jack;

a first position detector cooperating with said first hydraulic jack;

a third position detector cooperating with said third hydraulic jack;

a position signal of said rear wheel or track;

an electronic control unit electrically coupled to said position detectors, to said position signal and to said solenoid valves of said first slide valve.

10. The machine according to claim 9, wherein:

said position detectors comprise potentiometric detectors.

ABSTRACT

A machine for breaking up ground including, a frame supported by at least one pair of front wheels or tracks and by at least one pair of rear wheels or tracks. A driver's cab is made out of said frame and a means of breaking up the ground is connected to the frame. A traction system is supported by the frame and is for rotating one or more of the wheels or tracks. At least one rear wheel or track has a horizontal axis belonging to a chassis that is integral with said frame. The chassis is provided with at least one first actuator that works with maneuvering systems accessible from the driver's cab to rotate the rear wheel or track around a vertical axis while turning the front wheels or tracks of the machine.

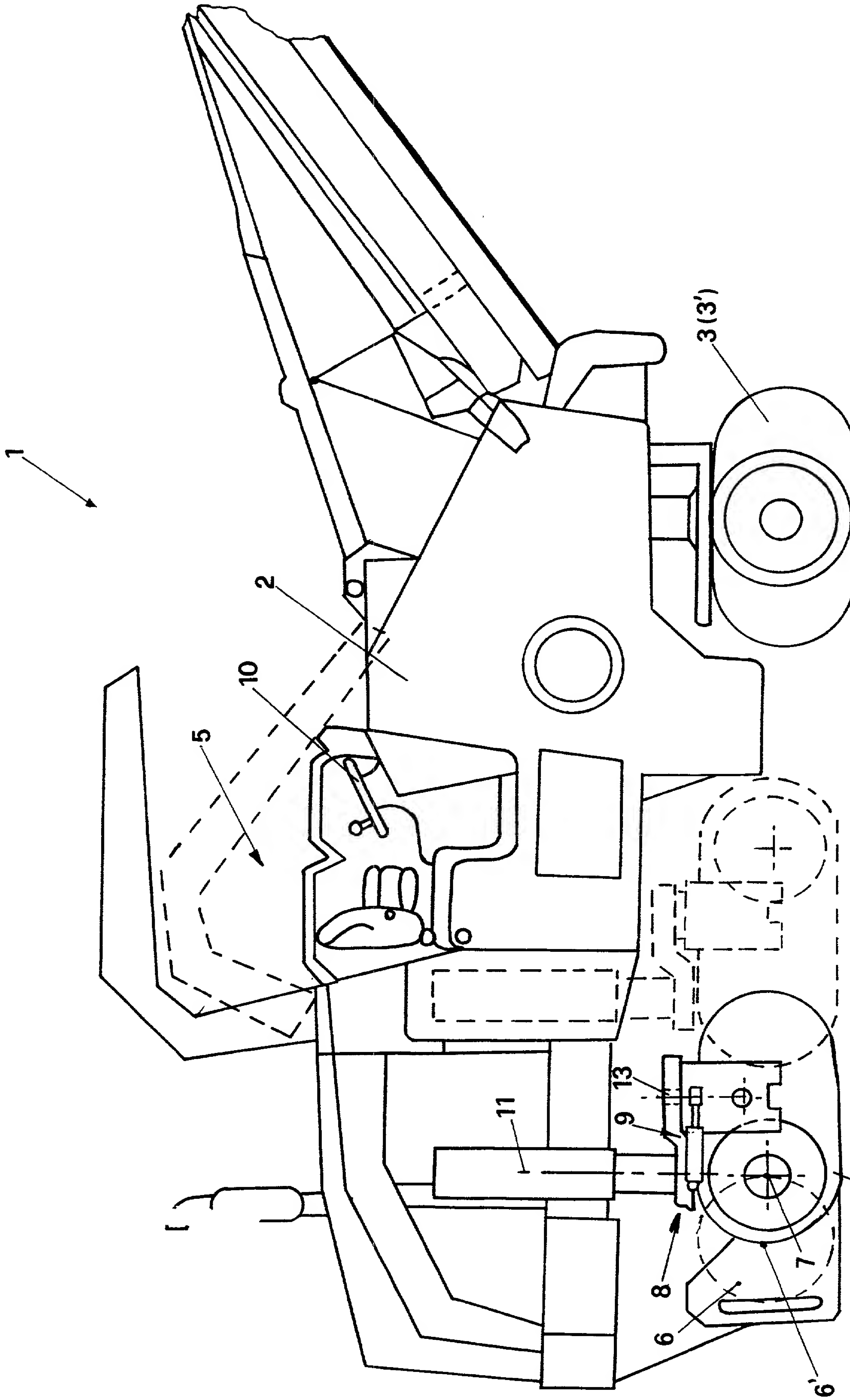

FIG.1

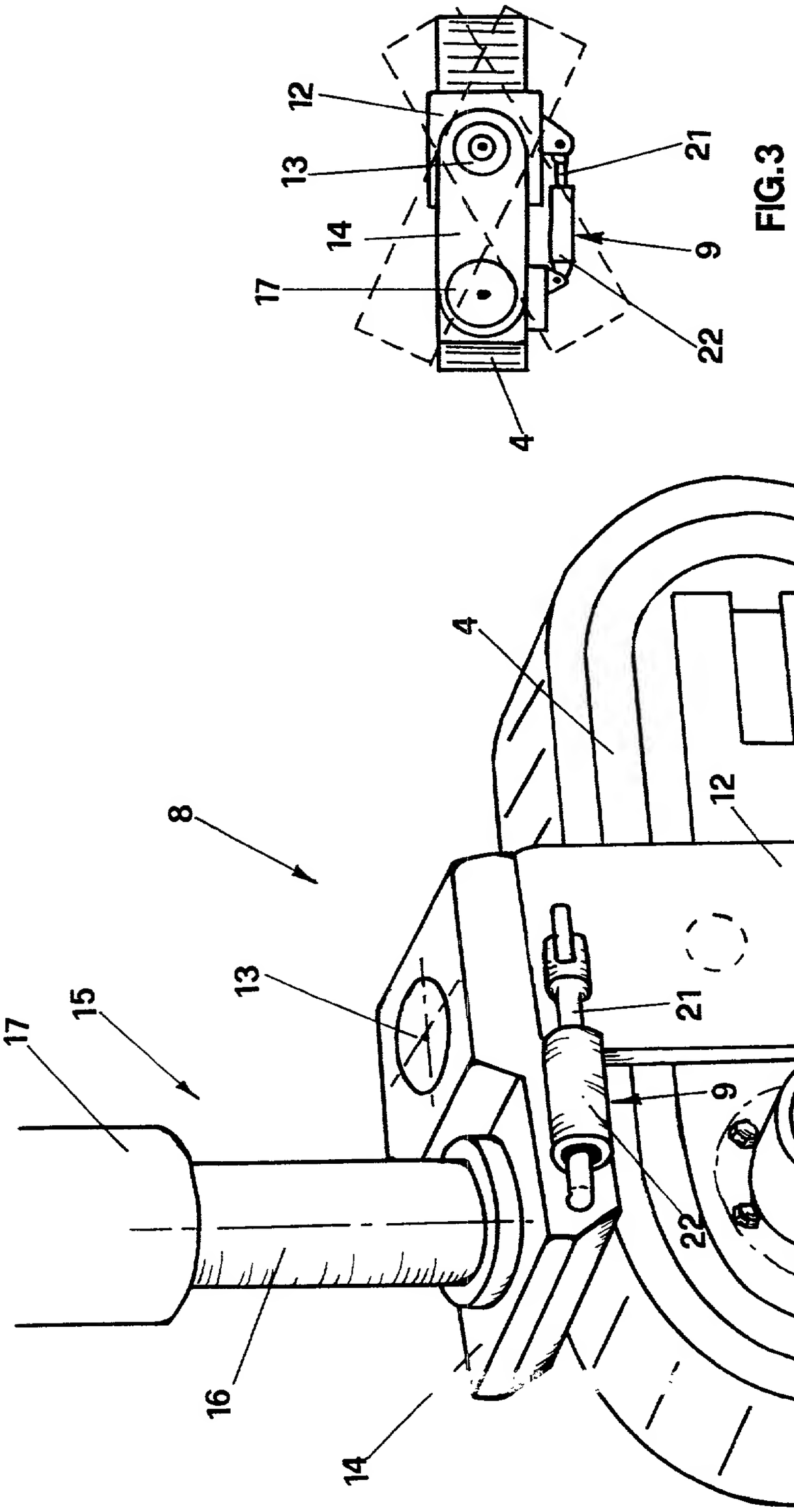

FIG.2

FIG.3

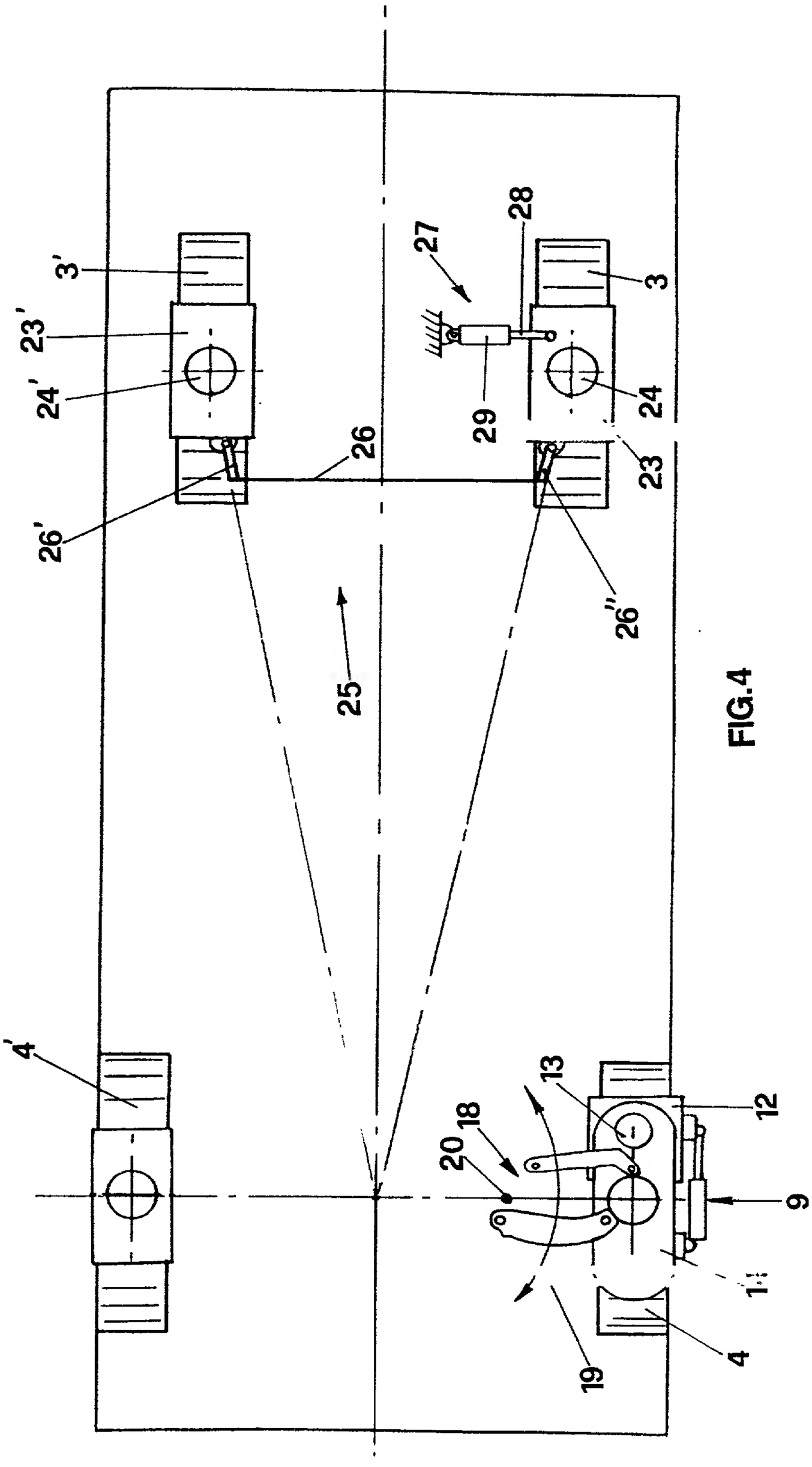

FIG.4

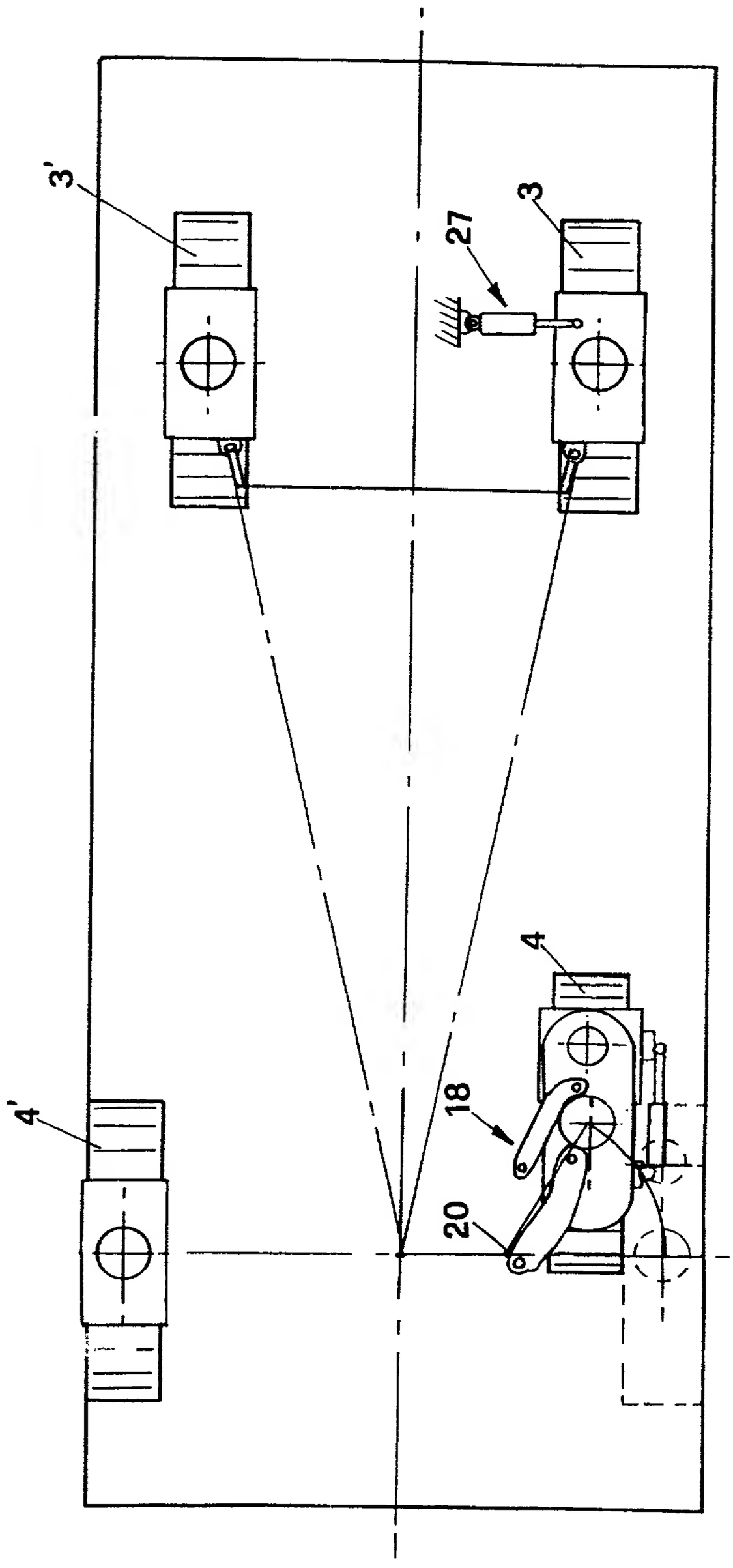

FIG.5

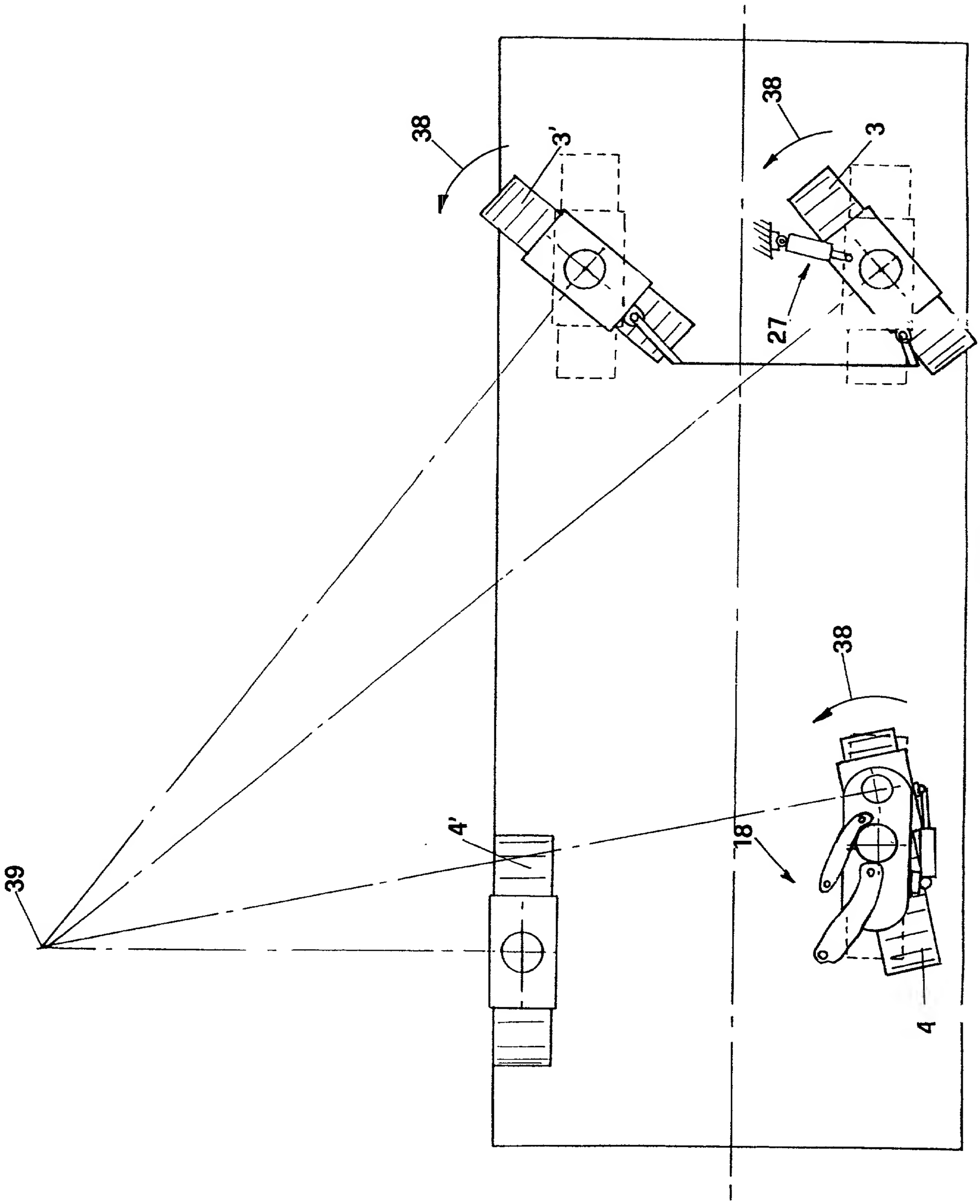

FIG.6

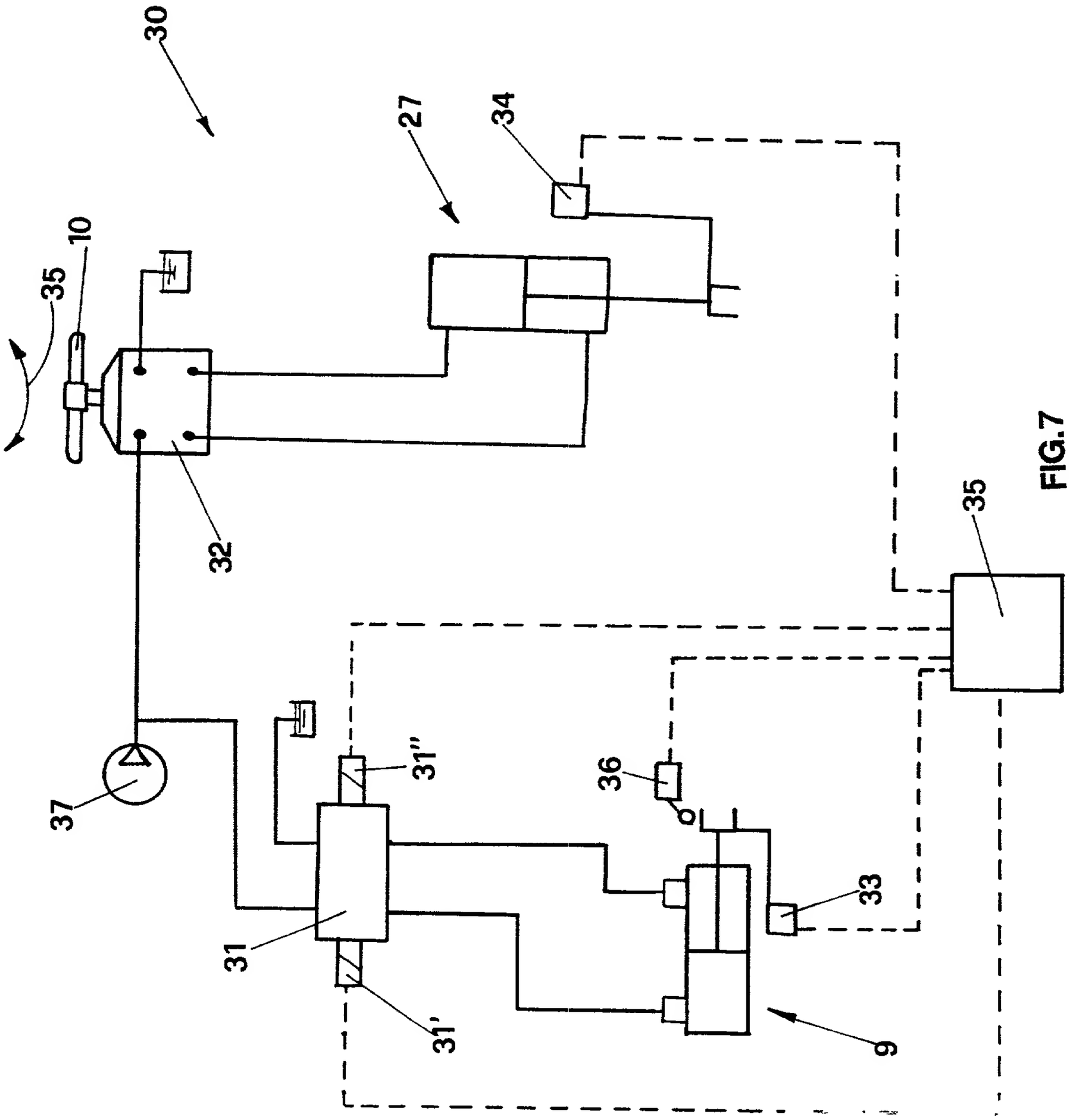

FIG.7

COMBINED DECLARATION AND POWER OF ATTORNEY FOR **UTILITY** PATENT APPLICATION (Includes PCT)	Attorney Docket No. 725/72073-2

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name; that

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:
HEAVY VEHICLE FOR BREAKING UP GROUND WITH RETRACTING AND STEERING REAR WHEELS

the specification of which (check one): [X] is attached hereto.

[ ] was filed on _____ as Application Serial No. _____ and was amended on _____.

[ ] was filed as PCT international application no. _____ on _____, and was amended under PCT Article 19 on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I do not know and do not believe the claimed invention was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application.

I hereby claim foreign priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application(s) on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed
VI99A000056 (Number)	ITALY (Country)	MARCH 23,1999 Day/Month/Year Filed	YES [X] Yes / [ ] No
_____ (Number)	_____ (Country)	_____ Day/Month/Year Filed	[ ] Yes / [ ] No
_____ (Number)	_____ (Country)	_____ Day/Month/Year Filed	[ ] Yes / [ ] No

I hereby claim the benefit under Title 35, United States Code, §119 (e) of any United States provisional application(s) listed below:

_____ Application No.	_____ Day/Month/Year Filed	_____ Application No.	_____ Day/Month/Year Filed

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Attorney Docket No. 725/72073-2

Application Serial No.	Filing Date	Status (patented, pending, abandoned)
Application Serial No.	Filing Date	Status (patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith; Watson Cole Grindle Watson, P.L.L.C.; Lawrence R. Radanovic, Reg. No. 23,077; Richard H. Tushin, Reg. No. 27,297; Donald N. Huff, Reg. No. 27,561; John P. DeLuca, Reg. No. 25,505; Robert J. Lasker, Reg. No. 22,785; Walter D. Ames, Reg. No. 17,913 and Roy W. Butrum, Reg. No. 18,290. Direct all telephone calls to telephone no. **(202) 628-3600** and faxes to **(202) 628-3650**.

Address all correspondence to **Watson Cole Grindle Watson, P.L.L.C., 10th Floor, 1400 K Street, N.W., Washington, D.C. 20005-2477.**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Post Office Address: VIA IV NOVEMBRE, 2 - 40061 MINERBIO (BO) - ITALY		
Full Name of Second, Joint Inventor	**Inventor's Signature**	**Date**
Residence:		**Citizenship**
Post Office Address:		
Full Name of Third, Joint Inventor	**Inventor's Signature**	**Date**
Residence:		**Citizenship**
Post Office Address:		